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# Federal Regulations Relevant to Asbestos Pollution Control

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# FEDERAL REGULATIONS RELEVANT TO ASBESTOS POLLUTION CONTROL

by

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The Asbestos Hazard Emergency Response Act of 1986 requires EPA to make rules in several areas related to asbestos hazards abatement which are covered by recommendations in the Guidance Documents. Failure to issue rules within the prescribed time frame automatically makes the latest published EPA guidance the rule. EPA is also required to study asbestos exposures in public and commercial buildings and recommend to Congress whether or not the same rules should apply to them as to schools. Responsibility for making laws and enforcing the compliance with these rules will become that of the individual State Governments.


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Health effects and epidemiological studies have established that breathing asbestos fibers can cause asbestosis, lung and other organ cancers, and mesothelioma.

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# INTRODUCTION

## Background

Asbestos, once termed a "miracle mineral" because of its unique physical and chemical properties that led to its widespread engineering use in the construction and manufacturing industries. Asbestos has become a recognized carcinogen in accordance with a linear zero-threshold model, meaning that any level of airborne asbestos presents some risk. Dr. Irving Selikoff of Mt. Sinai School of Medicine reports that asbestos is responsible for an estimated 10,000 deaths per year and will have killed over 200,000 people by the year 2000. These deaths are unavoidable because the exposure has already occurred and asbestos-related diseases have a 20 to 30 year latency period from exposure to onset of disease. This extended latency period makes health effect analysis most difficult using human cohort data.

Asbestos exposure may cause:

- asbestosis, a debilitating lung disease similar to silicosis
- lung cancer, a usually (about 90%) fatal disease.
- mesothelioma, a cancer of the lining of the chest and abdomen, which is always fatal.

Because of the durability of the mineral, asbestos is rarely destroyed. This contributes to its ubiqituous nature. Emissions occur from all aspects of mining, milling, manufacturing, use of the products containing asbestos, and during disposal of those products. Release occurs mainly because of the degradation of the material in which it is contained, rather than the degradation of asbestos itself.

In 1973, NESHAP banned spray-applied Asbestos Containing Materials (ACM) in most new buildings and established procedures for handling ACM during demolition.

The 1975 and 1978 revisions cover building renovations, the use of all type of insulating ACM in new buildings and asbestos emissions from ACM waste disposal. Further revisions will be forthcoming adding additional requirements for air monitoring of ACM during demolition, and requiring better containment of ACM during transport and disposal.

The NESHAP regulatory authority also dictates that asbestos removal from buildings be done "wet" rather than "dry" and requires "no visible emissions" from removal sites or during transportation and disposal of removed asbestos. Secondly, the Toxic Substance and Control Act (TSCA) was used to promulgate the "Friable Asbestos-Containing Materials in Schools; Identification and Notification Rule". Known as the Asbestos-in-Schools rule, it requires all primary and secondary schools, both public and private, to inspect the buildings for asbestos-containing materials (ACM), document the findings, and inform the employees and the PTA (or parents).

All school custodial personnel were to be given copies of EPA publication "A Guide for Reducing Asbestos Exposure" as published in the Federal Register (40 CFR Part 763).

Because of the life-cycle of the mineral, the Agency has retained authority over asbestos in deference to attempts to transfer the problem to OSHA. That is, asbestos presents environmental problems from cradle (mining) to grave (landfill) and EPA is the singular entity that can deal in a regulatory sense with the life-cycle of a substance.

For many years, rather than promulgating specific regulations for asbestos abatement activities, the Agency preferred to provide "Guidance Documents" which represented the "best engineering judgment" approach at the time.

Congress responded to increasing concern about asbestos by passing the "Asbestos Hazard Emergency Response Act of 1986", signed 10/21/86, which requires the Agency to promulgate regulations for schools. The major components of this legislation require:

- Within 180 days after enactment, EPA must propose regulations for inspection, for response actions in specific hazard conditions (damaged asbestos or high hazard), for implementation of the response and determination of successful completion, for operations and maintenance procedures, for periodic surveillance, for transportation and disposal, and for management plans.
- Within 180 days, EPA must develop a model accreditation plan for persons who inspect, manage the building, or conduct the abatement.
- Within 360 days, EPA must publish final rules.
- Within 720 days, with EPA funding, NBS must establish a lab accreditation program for air sampling and analyses.
- Within 990 days, schools must begin implementation of management plans.
- If EPA fails to publish regulations within 360 days, existing guidance will serve as the regulation, and schools are placed on a revised compliance timetable requiring implementation 990 days following enactment. Presumably, abatement procedures <u>not</u> described in existing guidance will then be outside of the law.

- o EPA, within 360 days, must submit to Congress a study to assess exposures within public and commercial buildings and recommend need for applicable standards.

Failure to comply with the requirements of this act can make the school agency liable for civil penalty fines of up to $5,000 per day per building.

The act establishes clearance values for post action airborne fiber concentrations of either (1) lower than ambient levels outside the building, corrected (somehow) for local sources, or (in the absence of good outside ambient air concentration data) .005 asbestos fibers/cc by TEM, or .003 asbestos fibers/cc by Scanning Electron Microscopy (SEM). It should be noted that most Electron Microscopists agree that positive I.D. of asbestos requires TEM.

The AHERA of 1986 has many implications for States, local school agencies, inspectors, planners/consultants, and contractors who perform asbestos abatement. It requires training, testing and certification programs, laboratory accreditation and determination by EPA whether the whole program should be applied also to public and commercial buildings. Asbestos abatement could become a major budget item for building owners and should not be ignored. It is not a problem with a simple "fix".

Some things that the bill did not address are:

1. How all of this will be financed.
2. Research on more cost effective abatement methods.
3. Sampling and analysis protocols to be used.
4. SEM limitations in asbestos identification.
5. What is the fate of abatement work by methods other than described in current EPA Guidelance?

For those in industry responsible for the management of buildings and facilities, an awareness of the presence, location, and condition of all ACM in your buildings is very important to the implementation or improvement of programs to minimize the hazards to occupants.

Also in 1986, EPA under TSCA proposed a "Ban and Phasedown Rule", which proposed a phased ban on manufacture or import of specific asbestos products for which known substitutes exist and proposed a 10-year time for an outright ban on asbestos-containing products. Final action on this proposal or an alternative (a phaseout of specific groups of products - e.g., construction materials, friction products, etc.) is scheduled for FY87.

OSHA rules were first issued in 1972 and modified in 1976 and are currently being revised again. They specify airborne exposure standards for asbestos workers, engineering and administrative controls, workplace practices, and medical surveillence and worker protection requirements. Details are published in the "Calendar of Federal Regulations" in Federal Register (47 FR 1807)

## ASBESTOS IN BUILDINGS

The major concern to the Agency at this time is the degradation or disturbance of in-place asbestos-containing materials in buildings, resulting in airborne asbestos concentrations which may be orders of magnitude higher than ambient levels outside the building. Dr. Selikoff reported that approximately 30 million tons of asbestos are in-place in buildings in the U.S., and OTS estimates about 750,000 public buildings and over 30,000 school

buildings contain asbestos. No new asbestos fireproofing is used today in buildings; however, the eventual removal of the existing in-place asbestos is a major technical and economic dilemma for the nation.

Problems with asbestos in buildings - deterioration, water damage, building modifications and accompanying disturbances and fiber release, painting, impacts, temperature changes, expansion and contraction, vibration, air currents, normal maintenance - all can cause various amounts of fiber release. Contact disturbance is the most common cause of release of large amounts of fibers.

Nature of Airborne Asbestos - Unless source is constant, which is uncommon, releases are episodic. Fibers can be spread by a common air handling system, and settle on surfaces if asbestos structures are too large to remain entrained in moving air. Sizes of most fibers found in air samples in buildings is small - below 5um in length with great majority much smaller than 5um. To place this better in perspective, .001 inch = 25um. Static electric charges and air flow patterns influence particle behavior and deposition on surfaces.

Ambient air samples usually show some very small asbestos fibers. Any building with indoor airborne asbestos concentration above outside levels causes those who enter to be at some increased risk for asbestos related health effects, in accordance with the "no threshold" theory of linear dose/response. EPA recommends that indoor airborne asbestos concentrations do not exceed local ambient levels. This may be difficult to achieve in many asbestos contaminated buildings, and requires deligent control measures just to minimize concentrations. Although most health effect researchers subscribe to the EPA-accepted "no threshold" dose response theory, a few feel that there may be a threshold exposure level below which excess cancers do not occur.

Every building owner should be aware of all ACM in his buildings. Unless he is unusually familiar with all the construction, materials, and systems in his buildings, this usually requires a survey by someone very knowledgeable about all of the uses and potential locations of ACM in buildings. The survey should inventory, locate and describe all of the ACM. Computer graphics have been applied to this purpose and can provide very convenient and rapid access to information.

After the survey identifies ACM in poor condition or damaged and releasing visible ACM, a special operations and maintenance (O&M) program should be initiated as soon as properly trained people and proper equipment are available. The initiation of the O&M program should be expedited. Note that the building owner is vulnerable for claims from occupants and should promptly post notices informing occupants that asbestos is present and warn of dangers from disturbing ACM. The O&M program should continue as long as any ACM remains in the building.

A word of caution is appropriate here. Because airborne asbestos fibers are almost always invisible, it is easy to take an attitude that what you can't see won't hurt you. The courts have not agreed with this philosophy where asbestos is concerned which has led to large awards for damages and skyrocketing liability insurance rates, or even complete elimination by some insurance people of liability coverage for asbestos claims. Because asbestos abatement done in a safe professional way in compliance with EPA guidleines is not inexpensive, many building owners have tried to deal with abatement with untrained maintenance and custodial employees. Before you do this, we would urge that you seek advice from your insurance company, a knowledgeable attorney familiar with asbestos related litigation, and have a professional inspection and survey of your building for ACM.

The EPA published guidelines for dealing with asbestos in buildings first in 1979 in a two-volume set. Updated information was presented in documents published in 1983 and 1985. Supplemental information has been published in other reports. All of the EPA guidelines are available by calling 800/424-9065, the EPA asbestos information number in Washington, D.C.

## Summary of Present EPA Guidelines on Abatement

EPA guidelines recommend three acceptable abatement methods for ACM.

1. Remove all ACM
2. Encapsulate ACM if appropriate
3. Enclose ACM behind barrier

### Removal

All abatement areas are to be enclosed by airtight barrier walls constructed on site of polyethylene sheets or other disposable impermeable sheets with the enclosed area kept at a lower pressure than the surrounding area by use of HEPA (high efficiency particulate air) filtered air pumps usually called negative pressure units. Four air changes of volume per hour minimum of ventilation air is to be pulled thru the air entry and exhausted from the work area thru the HEPA filters. In some interior areas of large buildings complicated arrangements must be made to find a place for air exhaust and/or for maintaining proper HVAC (heating, ventilating, and air condition- ing) conditions for the remainder of the building. EPA recommends first thoroughly wetting ACM with amended water (water and a surfactant) - then thoroughly scraping, brushing, picking, or, in some way, manually cleaning all ACM off surfaces on which it has been applied, picking up all waste ACM and placing it in heavy plastic bags and removing to an approved disposal site.

Large vacuum systems have been developed and used for dry removal of ACM, but EPA has little data on their performance and doesn't include any recommended use of these systems in the guidance documents. Unless some modifications of guidelines are made or a rule is issued allowing use of other than wetting and scraping removal, this will become the required removal procedure under the provisions of H.R. 5073 - The Asbestos Hazard Emergency Reponse Act of 1986.

Removal is the Agency-preferred option for abatement of asbestos-containing materials. As long as the asbestos remains in the building, a potential hazard exists. Obviously, the degree of hazard is a judgement call, based upon the location of the material, its condition, the likelihood of damage, and the potential impact of a release in that location. As long as asbestos-containing materials remain in the structure, an Operation and Maintenance program should be rigorously employed, requiring record-keeping, inspections, and unique custodial procedures. This can be a pain and is expensive. Also, the potential liability of the building owner continues. Finally, prior to buidling demolition, the NESHAP requires that all asbestos containing materials be removed. So in the end the asbestos must be removed anyhow.

In those cases where removal is not feasible, then encapsulation or enclosure may be employed.

Encapsulation

When EPA first considered abatement for ACM in about 1976, the idea of spraying the ACM with some paint-like material which would penetrate into the ACM, dry, and hold the fibers in place forever seemed promising.

On examination of the problem we decided that a good encapsulant would:

1. Retain the fibers--even if severely disturbed.
2. Penetrate ACM fully and bind ACM together and to the substrate on which it was applied.
3. Have a Class A (lowest) flame spread index.
4. Not release toxic gas or smoke in large enough quantities to prevent escape from a fire scene.

Out of about 150 candidates tested, only 11 fully met all criteria set forth and about 20 others came close enough to be considered acceptable.

Problems encountered were not unforeseen by those knowledgeable about these materials but briefly they were:

1. Candidate encapsulant required thinning with water to get penetration - then resins didn't fully penetrate.
2. Surface was sealed before any deep penetration could occur.
3. Strength was reduced and weight of ACM was increased when saturated with water based encapsulant causing delamination and fallout.
4. Too much smoke or toxic gas in fire condition or too rapid flame spread was observed.
5. Large amount of encapsulant was required - less than 30 sq ft per gallon was common. (Occassionally good penetrants required 1 gal to cover less than 20 square feet).

The development of a test to measure the relative fiber retention properties has proved difficult to say the least. Everything from a "calibrated rub" of the hand - then visually examining it for dust - to elaborate test chambers with acoustic disturbance and air sampling provisions were proposed. The fact is that no simple, low cost, repeatable and acceptable test has yet been devised.

Because of the uncertainty that encapsulation is an effective, long-term solution to ACM hazards, it is now used mostly as a substitute for meticulous detail removal of small difficult to clean patches of ACM remaining on beams, floor pans, ducts, etc., after removal of the great majority of the ACM. Contractors spray the remaining "fuzzies" with encapsulant so that they will not be allowed to become airborne during "clearance" sampling. It is not yet clear what the long-term consequences of this practice will be. Operation and Maintenance procedures are necessary for the life ot the building to asure integrity of the encapsulation.

Enclosure

The sealing off of a ceiling, wall or beam with an impermeable barrier such as drywall with taped and filled joints is an acceptable alternative to removal where special circumstances make it desirable to leave ACM in place. This is not prudent if the barrier must be violated for periodic maintenance. Building records should show location of enclosed ACM to insure removal prior to building demolition. Again, continual O&M procedures need to be instituted for the life of the building.

Clearance Sampling

Clearance sampling per EPA guidance is performed after removal (or other abatement) is complete and all visible ACM has been cleaned from all surfaces in the abatement area. This is done to determine if residual asbestos concentrations are low enough for reoccupation of the area. Use of air blowers, wet wiping, brushing, and strong lighting to find and remove ACM from surfaces is necessary to get an abatement area clean enough to pass the clearance test. Aggressive air sampling is conducted by setting up several air pumps to pull air from the abatement area, through special 25um air sampling filters, trapping any airborne asbestos for microscopic analysis by

TEM. This aggressive sampling is conducted while leaf blowers and/or fans are used to stir up any settled asbestos fibers and keep them airborne. If the analysis by phase contrast microscopy (PCM) shows that the airborne asbestos fiber concentration is above ambient levels, EPA recommends that additional cleaning be performed before another "clearance" sample is run.

Technically, EPA acknowledges two analytical techniques for post-abatement clearance -- Phase Contrast Microscopy (PCM) and Transmission Electron Microscopy (TEM). Each has a place and should be used in conjunction with each other. PCM is a very technically limited technique which could be termed "quick and dirty". PCM samples cost about $30 each, can be run on site in an hour or so after collection but have very limited power of resolution (e.g., cannot "see" below 0.2 micron and cannot distinguish asbestos fibers from non-asbestos fibers). Transmission electron microscopy can identify asbestos and has a significantly better resolution capability. In our tests, PCM has missed as much as 99 percent of the asbestos measured by TEM in an aerosol from drilling asbestos board. Because TEM analyses cost about 15 times as much as PCM and it takes about a week to receive the results of a TEM analyses, it is good economic sense to take only PCM samples until no fibers appear, then do TEM sampling.

In our technical opinion at this point in time, PCM should never be the sole method for abatement clearance. In the Asbestos Hazard Energy Response Act of 1986, use of PCM for clearance sampling is not allowed; however, SEM (scanning electron microscopy) is allowed and it does not offer much improvement over PCM.

REFERENCES


1. U. S. Environmental Protection Agency.
"Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 2." Office of Toxic Substances, U. S. Environmental Protection Agency, Washington, D.C. C00090, March 1979.

2. Sawyer, R. N. and Sponsor, D.M.
"Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 2." Office of Toxic Substances, U. S. Environmental Protection Agency, Washington, D.C. C00090, March 1979.

3. U. S. Environmental Protection Agency.
"Guidance for Controlling Friable Asbestos-Containing Materials in Buildings." Office of Toxic Substances, U. S. Environmental Protection Agency, Washington, D.C. EPA 560/5-83-002, March 1983.

4. U. S. Environmental Protection Agency
"Guidance for Controlling Asbestos-Containing Materials in Buildings." EPA 560/5-85-024, June 1985.

5. PL 99-519 Asbestos Hazard Emergency Response Act of 1986.